Cholesteatoma: skin in the wrong place

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Not many years have passed since chronic ear disease with cholesteatoma presented a grave threat to life. A big step forward was recognition of the need for surgical drainage and its logical extension to exteriorization of disease. Improvements in technique and equipment together with the advent of antibiotics then allowed the otologist to progress from a desperate struggle to salvage the patient to the structured surgical approach of today in which the aim is to preserve undamaged and salvageable tissue and reconstruct where possible.

There is still some debate as to the nature of cholesteatoma, but a more accurate term might be keratoma or epidermoid cyst. Regarding pathogenesis, the majority view probably now favours retraction of Shrapnel's membrane or the posterosuperior quadrant of the pars tensa, which develops into a gradually expanding cyst containing epithelial debris that has locally erosive properties.

Before discussing my own experiences in dealing with cholesteatoma let me clarify some definitions and clear up some misconceptions. First, a distinction between recurrent and residual cholesteatoma is crucial to the understanding and comparison of different surgical techniques. As Smyth[1] stated: 'Recurrent cholesteatoma is the development of a new cholesteatoma. It takes the form of a retraction pocket similar to the original disease. Residual cholesteatoma arises from the failure to remove all of the original disease from the tubotympanic cleft'. According to the published work, the residual disease rate is much the same for open or closed techniques[2–7]. The high risk areas are in the middle ear—the sinus tympani and oval window and the attic, especially the anterior epitympanic area (Figure 1). These are all areas covered by grafting in any method other than a true radical exploration, hence the similarity in residual disease rates for open and closed techniques (Figure 2). There is obviously considerable variation between the results of individual surgeons, and some have presented figures for both techniques. If the percentages are averaged (a statistically risky thing to do) the residual disease rate for closed cavities is 10.2% and open cavities 11.4%, an unimpressive difference. Residual disease in the mastoid bowl itself is rare, as one might expect since it is the easiest area to access

Figure 1 **Site of residual cholesteatoma**

and all cholesteatoma-bearing bone is drilled away to create the cavity[8–10].

Now that the lethal complications[11,12] which so concerned our predecessors are rare we can afford to concentrate on the symptoms that brought our patients to see us, namely chronic aural discharge and hearing loss. There should no longer be any excuse for the situation alluded to by Palva in 1982[13], who stated: 'patients with continuously discharging cavities are post-operatively in their opinion much worse off than they were pre-operatively'.

Here I present the results of three surgical techniques I have used in the management of chronic middle ear disease with cholesteatoma. In the preoperative interview I stress to the patient that the aim of the procedure is to provide a dry, safe, trouble-free ear and that a hearing gain should be considered a bonus. The patient may well have satisfactory hearing on the other side, and even the most skilled otologist will struggle to equal a normal hearing ear when dealing with the damage inflicted by years of chronic ear disease. I have therefore avoided complex formulae and assessment of air-bone gaps; these may highlight the skill of the surgeon but probably bear little relation to patient benefit. I have looked at three aspects. The first is hearing in the opposite ear. The second, if the opposite ear is unsatisfactory, the hearing in the operated ear assessed by the 'Belfast rule of thumb'—hearing better than 30dB at 0.5, 1, 2 and 4kHz, or improved to within 15dB of the

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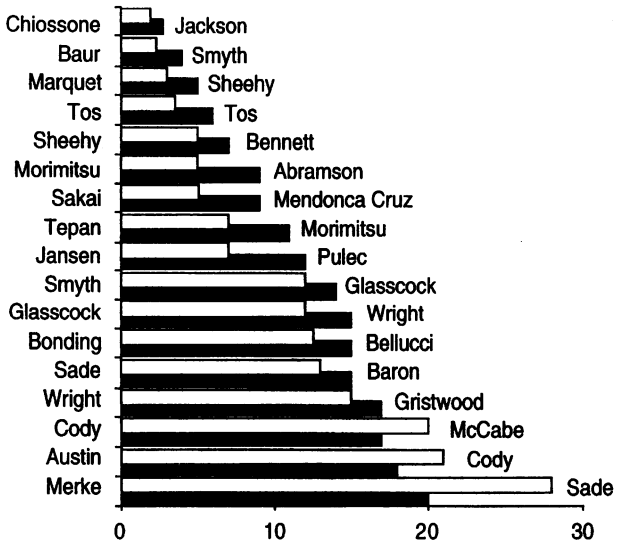

Figure 2 **Reported rates of residual cholesteatoma taken from the last three International Cholesteatoma Conferences. □=closed cavity; ■=open cavity**

other ear[14]. The third, when neither ear is functioning well, is whether the patient is wearing a hearing aid satisfactorily.

ELEVATION AND EXCISION OF RETRACTION POCKETS

A total of 14 ears have been treated in this way, with follow-up from 3 to 7 years (mean 5 years). By the Marquet technique[15] a mini grommet is inserted anteriorly and the pocket is elevated and excised leaving a traumatic perforation in the tympanic membrane. Unlike Brooker and Smyth[16] I make no attempt to repair or reinforce the tympanic membrane and no incision is made in the canal wall[17]. So far, two patients have required more extensive cholesteatoma surgery for recurrent disease. One, with residual epithelial pearl, needed a tympanotomy and three with remaining perforations required myringoplasty. All tympanic membranes are now intact but three show evidence of poor ventilation. As regards hearing results, of the 14 patients, 12 have satisfactory hearing on the operated side and there were two patients who did not have normal hearing on the other side.

ATTICOTOMY WITH BONE PATÉ REPAIR

63 ears have been treated in this way, with follow-up from 1 to 13 years (mean 5 years) and a follow-up compliance of 94%. When, by expansion of the natural atticotomy, the limits of the sac can be defined, there is the possibility of dissecting the matrix out intact and delivering the cholesteatoma into the external ear. If an intact pocket has been removed the defect in the attic can now be safely repaired thus avoiding the risk of an unstable atticotomy and disease recurrence. Fat is dissected from the subcutaneous tissue of the postaural incision or the muscular periosteal flap and placed into the attic defect to protect the ossicular chain (if it is intact) and to support the bone paté which completes the repair. Fibrin glue is used to stabilise the bone paté and prevent it being washed away by any postoperative bleeding. In a mean follow-up of 5 years only one patient has developed recurrent disease and required more extensive surgery, although eight others have required additional surgery for various reasons (average, 1.1 operations per patient). The present status of these patients is largely satisfactory. There are five (8%) in whom the attic is not ideal but they are stable at present. Any evidence of instability would require further surgery to reinforce the attic with additional bone dust or autograft cartilage. No patients in this group have required conversion to an open cavity.

With regard to hearing results, of the 63 patients 36 have normal hearing in the non-operated ear. Of the remaining 27, 18 have ears that satisfy the Belfast rule of thumb and six are using hearing aids satisfactorily, leaving only three patients with residual hearing handicap.

COMBINED-APPROACH TYMPANOPLASTY WITH BONE PATÉ REPAIR

The final technique relates to the more extensive cholesteatomas or to attic disease not suitable for atticotomy and bone paté repair. This combined-approach tympanoplasty method was developed over the past 20 years. The early attempts date from about the time of Gordon Smyth's historic warning on the limitations of the technique, and my aim has been to address the problems of residual and recurrent disease[18]. Residual disease responds satisfactorily to staging, provided that all the appropriate stages are strictly completed[19,20] All patients are booked for a second-look operation after 12 months. If there is residual disease which is ruptured during removal, or is already diffuse, then a further stage is required. Latterly, the surgical laser has halved the incidence of residual disease and third-stage surgery has rarely been required, although only a minority of patients have been treated in this way. Recurrence is not so easy to deal with[21]. After several years of trial and error with different methods for repairing the outer attic wall[22–26], bone paté was found to be the most effective. It replaces bone with bone and can easily be added to or drilled away at subsequent stages, affording great surgical flexibility.

In conjunction with the canal wall repair, ventilation of the middle ear and mastoid is crucial. The use of silastic sheet from the mastoid through the attic and posterior tympanotomy into the middle ear ventilates the lower route, whereas the performance of a superior tympanotomy[27] along

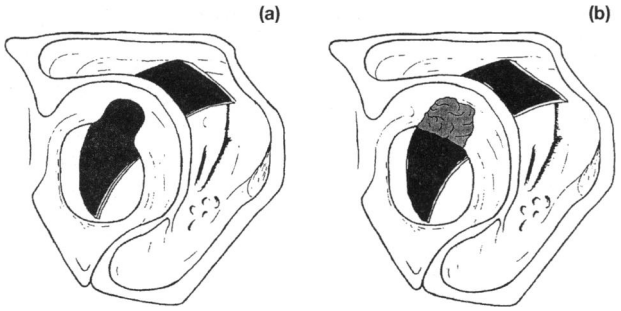

Figure 3 **The use of Silastic sheet and bone paté in combined-approach tympanoplasty. (a) Silastic sheet in attic and middle ear; (b) Silastic sheet and bone paté**

the roof of the attic to the anterior epitympanic cell and back into the middle ear provides a superior ventilation route. In addition to supporting the bone paté repair the silastic prevents adhesions between the tympanic membrane and the medial wall of the middle ear and consequent tensa retraction. As in the atticotomy technique, the bone paté is stabilized with fibrin glue (Figure 3).

A total of 300 patients have been treated by combined-approach tympanoplasty with bone paté repair. There has been a 90% follow-up rate, from 1 to 16 years (mean 8 years). Residual cholesteatoma was found at the second stage (after 12 months) in 61 cases (20%). Most of this residual disease takes the form of discrete epithelial pearls which can be dissected out intact. Some, however, rupture on removal or are already diffuse and a further stage is then necessary. 38 patients (12.7%) have required a third stage to eliminate disease and eight (2.7%) have gone on to a fourth operation. Of the 95 patients in whom a laser was used, only three (3.2%) have required a third stage and none a fourth stage. At the second stage the attic repair is carefully checked. Retraction pockets are visible per-meatally in less than 5%, while elevation of the tympanomeatal flat reveals additional areas of inadequate bone repair in another 8%; further bone paté is used to eliminate these defects. Cholesteatoma has recurred in six patients to date, all between 2 and 6 years postoperatively; all six have had a repeat combined-approach tympanoplasty and are well with stable ears. Thus repair of the attic defects with bone dust, with a check and if necessary reinforcement at 12 months, seems to confer lasting stability in this otherwise unstable area. There have been a small number[13] of subsequent operations for ossiculoplasty and myringo-plasty and overall the average number of operations for the 300 patients has been 2.2. Current evaluation reveals 12 patients in whom the attic is not ideal. These patients are under regular review and any sign of instability will signal the need for reinforcement surgery. It is noteworthy that only four patients have been converted to an open cavity. I like to think that this answers the criticism that combined-approach tympanoplasty is nothing more than a two-stage open-cavity mastoidectomy.

With regard to the hearing results of combined-approach tympanoplasty, the 300 patients have 215 normal contra-lateral ears. Of the 85 patients who did not have normal hearing on the other side, five had dead ears preoperatively and hence could not benefit; 36 operated ears satisfied the Belfast rule of thumb, and a further 27 were satisfactorily aided, leaving 17 with disability not helped by surgery.

CONCLUSIONS

If the results of these three techniques are combined, wet ears are present in just under 2% of cases and a hearing handicap persists in a little over 5%. Palva[28] suggests that a cholesteatoma recurrence rate of less than 10% is satisfactory. If the cholesteatoma recurrence rate in this series is added to the figures for persistent discharge and hearing handicap the total equates to 9%. These surgical techniques for cholesteatoma therefore not only control the underlying disease but also resolve the presenting symptoms, with a failure rate of less than 10%.

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